H0004181-5601

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| **In re the Application of:** | |
| **ROBERT D. HORNING** | |
| **Serial No.: 10/673,453** | **Art Unit: 2834** |
| **Filed: September 30, 2003** | **Examiner: TAMAI, Karl I.** |
| **For: POLYMER ACTUATOR HAVING A CIRCULAR UNIT CELL** | |

## APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 35 U.S.C. §134 and C.F.R. §41.31, Appellant submits this Appeal Brief to appeal the Examiner's rejection of claims 1-15 and 22-26 in the final Office Action mailed November 18, 2005.

## TABLE OF CONTENTS

I. REAL PARTY IN INTEREST ..... 3

II. RELATED APPEALS AND INTERFERENCES ..... 3

III. STATUS OF THE CLAIMS ..... 3

IV. STATUS OF AMENDMENTS ..... 3

V. SUMMARY OF CLAIMED SUBJECT MATTER ..... 4

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL ..... 7

VII. ARGUMENT ..... 7

VIII. LISTING OF CLAIMS ..... 10

IX. EVIDENCE APPENDIX ..... 10

X. RELATED PROCEEDINGS APPENDIX ..... 10

## I. REAL PARTY IN INTEREST

The named inventor has assigned all ownership rights in the pending application to Honeywell International, Inc., 101 Columbia Road, Morristown, NJ, 07962, which is the real party in interest.

## II. RELATED APPEALS AND INTERFERENCES

The appellant, their legal representatives, and the assignee are not aware of any other pending appeals, interferences or judicial proceedings which may be related to, will directly affect or be directly affected by, or have a bearing on the Board's decision in this appeal.

## III. STATUS OF THE CLAIMS

Claims 16-21 are withdrawn. Claims 1-15 and 22-26 stand rejected. The rejection of claims 1-15 and 22-26 is being appealed.

## IV. STATUS OF AMENDMENTS

No claim amendments have been made in this application in response to the last Office Action dated November 18, 2005. The status of the claims in this application is as set forth above and in Appendix A.

## V. SUMMARY OF CLAIMED SUBJECT MATTER

The presently claimed invention is related to an improved microactuator that is constructed from layered sheets of polymer having conductive and dielectric layers. As noted in the background section of the instant application, polymer-based microactuators have recently been emerging, as evidenced by U.S. Patent 6,255,758 to Cabuz, Horning (*the named inventor in the instant application*) and Herb ("Cabuz et al."). Polymer microactuators have advantages over traditional microelectromechnical systems (MEMS), which are typically constructed from silicon, which can be brittle and thus subject to breaking. In contrast, polymer-based devices are more flexible and tend to be less expensive to manufacture compared to their silicon-based counterparts.

Cabuz et al. discloses a polymer actuator array that includes a plurality of sheets that are layered upon one another. Every other sheet is flat, and sheets disposed between the flat sheets are corrugated resulting in what can be considered a plurality of "linear" unit cells. (See Background section of the instant application, and Cabuz et al.) Horning et al. (US 2002/0125790), expressly cited against the claims of the instant application, is another example of a polymer-based actuator having linear unit cells. These cells can be caused to collapse on themselves by applying a voltage and causing an electrostatic force to build up between the sheets.

Robert Horning, the named inventor on the instant application (as well as a named inventor in Cabuz et al. and Horning et al. mentioned above), improved upon the technology described in Cabuz et al. and Horning et al. by changing the unit cell shape from linear to circular. This is the essence of the claimed invention. A change in the unit cell shape from

linear to circular allows designs to be configured with virtually any force and displacement specifications. Moreover, a circular unit cell also has a theoretical efficiency of nearly 100% so that nearly all electrical input energy is converted to useful work. (See, e.g., Para. [0005] of the present application.)

Claim 1 of the instant application recites a microactuator device that includes at least a pair of polymeric sheets (See, Fig. 2, reproduced below, elements 100, 101) each having conductive (112) and dielectric (114) films deposited thereon.

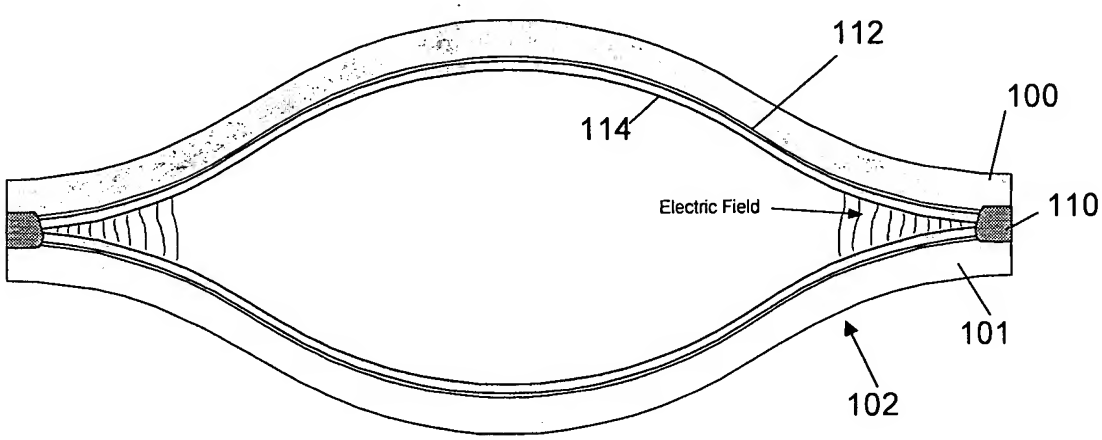



FIG.2

The polymeric sheets face each other and are bonded together to create at least one cell having a substantially circular shape parallel to a plane in which the polymeric sheets lie. See Figure 1 (reproduced below).

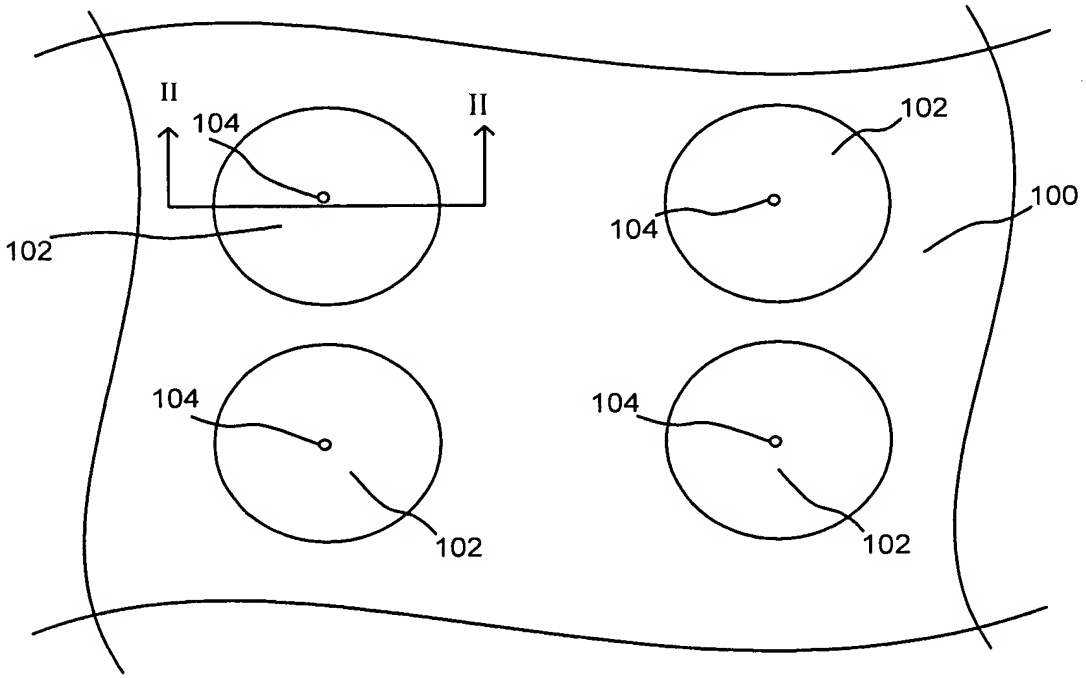



**FIG. 1**

The at least one cell has at least one egress hole (104) to allow a fluid to pass there through when a source of electric potential is applied to the conductive films to cause a portion of the polymeric sheets in the vicinity of a perimeter of the cell to be attracted to one another and thereby cause the cell to retract.

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are to be reviewed on appeal:

(1) Claims 1-15, 23 and 24 under 35 U.S.C. §103(a) over the combination of Horning et al. (US 2002/0125790) and Ohnstein (US 5,180,623); and

(2) Claims 24-26 under 35 U.S.C. §103(a) over the combination of Horning et al., Ohnstein and Scheurenbrand et al. (US 6,182,941).

## VII. ARGUMENT

### A. The 35 U.S.C. §103 rejection of claims 1-15, 23 and 24 based on a combination of Horning et al. and Ohnstein is improper and should be withdrawn.

To establish a prima facie case of obviousness, there must be (1) some suggestion or motivation (either in the references themselves or in the knowledge generally available to one of ordinary skill in the art) to modify the reference or to combine reference teachings to achieve the claimed invention, and (2) the prior art must teach or suggest all the claim limitations. MPEP §2143.

The Federal Circuit has recently elaborated on the necessity of clear articulation of the motivation for combining elements disclosed in different prior art references. As noted by the Federal Circuit,

> [m]ost inventions arise from a combination of old elements and each element may often be found in the prior art. However, mere identification in the prior art of each element is insufficient to defeat the patentability of the combined subject matter as a whole. Rather, to establish a prima facie case of obviousness based on a combination of elements disclosed in the prior art, the Board must articulate the basis on which is concludes that it would have been obvious to make the claimed invention. In practice, this requires that the Board explain the reasons one of ordinary skill in the art

> would have been motivated to select the references and to combine them to render the claimed invention obvious....
>
> When the board does not explain the motivation, or the suggestion or teaching, that would have led the skilled artisan at the time of the invention to the claimed combination as a whole, we infer that the Board used hindsight to conclude that the invention was obvious.

*In re Leonard R. Kahn*, Slip Op. 04-1616 (Fed. Cir. 2006) (internal citations omitted)(emphasis added).

As noted above, Horning et al. describe a MEMS actuator that has a linear unit cell configuration in that the polymer sheets are arranged in a corrugated fashion. Specifically, paragraph [0006] of Horning et al. states: the [polymer] sheet pairs are bonded together along continuous bonded locations extending across the sheets. As such, the final Office Action correctly concedes that Horning et al. do not disclose the claimed circularly-shaped cell.

For this feature of the claimed invention, the final Office Action cites Ohnstein, which discloses a circular electronic microvalve that is fabricated from single crystal silicon (col. 2, lines 43-45). As further disclosed by Ohnstein, the various components of the valve are fabricated using well-known semiconductor etching techniques. (See, e.g., col. 3, line 59 to col. 4, line 12.)

Page 2 of the Office Action makes the following conclusiory remarks about the combination of Horning et al. and Ohnstein:

> It would have been obvious to a person of ordinary skill in the art at the time of the invention to construction [sic] the actuator of Horning with the dielectric and conductive layers being circular films with an egress hole to form a valve with a mating surfaces [sic] between the electrodes.

However, as is evident, there is no articulation at all as to why one would have been motivated to change the configuration of the linear polymer cells of Horning et al. to circular polymer cells. In the "Response to Arguments" section of the final Office Action on page 4, the Examiner responds to applicant's prior argument that the polymer and silicon-based devices are not analogous by stating that the "field of endeavor is MEMS electrostatic devices, which find use in actuators, sensors, switches, pumps valves." However, once again, the Examiner provides no rationale, reason, or articulation as to why it would have been obvious to change the linear polymer cells of Horning et al. into the claimed polymer circular cells of the invention in view of Ohnstein. Consequently, the Examiner has failed to make a prima facie case of obviousness.

For at least these reasons, the §103 rejection of claims 1-15, 23 and 24 based on a combination of Horning et al. and Ohnstein should be withdrawn.

**B. The 35 U.S.C. §103 rejection of claims 24-26 under 35 U.S.C. §103(a) based on a combination of Horning et al., Ohnstein and Scheurenbrand et al. is improper and should be withdrawn**

Scheurenbrand et al. was cited for disclosing an electrostatic valve that has an egress hole on only one side of the device. However, this reference does not overcome any of the deficiencies associated with the combination of Horning et al. and Ohnstein described above.

Accordingly, the §103 rejection of claims 24-26 based on Horning et al., Ohnstein and Scheurenbrand et al. should also be withdrawn.

**C. Conclusion**

For all of the above reasons, it is respectfully asserted that the pending claims of the present application would not have been obvious to those of ordinary skill in the art because there is no reason why those skilled in the art would have been motivated to modify the polymer-

based linear unit cell configuration into a circular unit cell, as claimed. Accordingly, the Board should overturn the present rejections. Reversal of the pending rejections of record and allowance of the claims of this application is respectfully requested.

## VIII. LISTING OF CLAIMS

(See Appendix A)

## IX. EVIDENCE APPENDIX

(None.)

## X. RELATED PROCEEDINGS APPENDIX

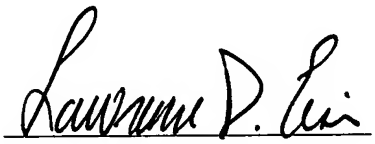
(None.)

PILLSBURY WINTHROP
SHAW PITTMAN LLP
1650 Tysons Boulevard
McLean, VA 22102
Tel: 703/770-7900

Respectfully submitted,

ROBERT D. HORNING

Date: April 20, 2006

By: 
Lawrence D. Eisen
Registration No. 41,009

Customer No. 00128

LDE/dkp

**APPENDIX A**

**Listing of Claims:**

1. (Original) A microactuator device, comprising:

at least a pair of polymeric sheets each having conductive and dielectric films deposited thereon, the polymeric sheets facing each other and bonded together to create at least one cell having a substantially circular shape parallel to a plane in which the polymeric sheets lie, the at least one cell having at least one egress hole to allow a fluid to pass there through when a source of electric potential is applied to the conductive films to cause a portion of the polymeric sheets in the vicinity of a perimeter of the cell to be attracted to one another and thereby cause the cell to retract.

2. (Original) The microactuator device of claim 1, comprising a plurality of cells.

3. (Original) The microactuator device of claim 2, comprising a plurality of pairs of polymeric sheets laminated to each other to form a stack.

4. (Original) The microactuator device of claim 1, wherein one of the pair of polymeric sheets is substantially flat.

5. (Original) The microactuator device of claim 1, wherein each one of the pair of polymeric sheets is bowed.

6. (Original) The microactuator device of claim 1, further comprising adhesive for bonding the polymeric sheets.

7. (Original) An electrostatic microactuator, comprising:

a plurality of substantially circular cells arranged in a predetermined pattern and obtained by bonding sheets of polymeric material together with substantially circular patterns;

at least one fluid egress passage provided in each of the cells;

the sheets of polymeric material including conductive and dielectric films disposed thereon such that when a source of electric potential is applied to the conductive films the polymeric sheets in the vicinity of a perimeter of each of the cells are attracted to one another to cause the cells to contract.

8. (Original) The microactuator device of claim 7, comprising a plurality of pairs of polymeric sheets laminated to each other to form a stack.

9. (Original) The microactuator device of claim 7, wherein one of the polymeric sheets is substantially flat.

10. (Original) The microactuator device of claim 7, wherein a portion of each of the polymeric sheets associated with a given cell is bowed.

11. (Original) The microactuator device of claim 7, further comprising adhesive for bonding the polymeric sheets.

12. (Original) An electrostatic microactuator, comprising:

a first polymeric sheet having a conductive film and a dielectric film disposed thereon;

a second polymeric sheet having a conductive film and a dielectric film disposed thereon; and

an adhesive disposed and patterned between the sheets to provide a plurality of substantially circular cells, wherein each of the cells includes a fluid egress hole,

wherein the cells are operable to contract as a result of an electrostatic force created upon application of an electrical potential to the respective conductive films of the first and second polymeric sheets.

13. (Original) The electrostatic microactuator of claim 12, comprising a plurality of pairs of polymeric sheets laminated to each other to form a stack.

14. (Original) The electrostatic microactuator of claim 12, wherein one of the polymeric sheets is substantially flat in the vicinity of a given cell.

15. (Original) The electrostatic microactuator of claim 12, wherein a portion of each of the polymeric sheets associated with a given cell is bowed.

16. (Withdrawn) A microactuator device that minimizes energy loss, comprising a plurality of electrostatically controllable cells disposed adjacent one another, at least one of the cells having a substantially circular shape, wherein the at least one of the cells exhibits a substantial constant velocity pull in after a threshold pull in voltage is applied to opposing surfaces of the at least one cell.

17. (Withdrawn) The microactuator device of claim 17, wherein the device is comprised of a pair of polymeric sheets.

18. (Withdrawn) The microactuator device of claim 17, comprising a plurality of layers of cells.

19. (Withdrawn) A microactuator device that minimizes energy loss, comprising a plurality of electrostatically controllable cells disposed adjacent one another, at least one of the cells having a substantially circular shape, wherein a force generated by the at least one of the cells, after a threshold pull in voltage is applied to opposing surfaces of the at least one cell, is independent of displacement.

20. (Withdrawn) The microactuator device of claim 19, wherein the device is comprised of a pair of polymeric sheets.

21. (Withdrawn) The microactuator device of claim 19, comprising a plurality of layers of cells.

22. (Previously Presented) The microactuator device of claim 1, wherein a force generated by the at least one cell, after a threshold pull in voltage is applied to opposing surfaces of the at least one cell, is independent of displacement.

23. (Previously Presented) The microactuator device of claim 1, wherein the at least one cell exhibits a substantial constant velocity pull in after a threshold pull in voltage is applied to opposing surfaces of the at least one cell.

24. (Previously Presented) The microactuator device of claim 1, wherein the at least one egress hole is defined by only one side of the at least one cell and an opposite side of the cell is does not define any openings therein.

25. (Previously Presented) The microactuator device of claim 1, wherein the at least one egress hole is provided such that fluid flow is restricted to move through only one of the pair of polymeric sheets.

26. (Previously Presented) The microactuator of claim 1, wherein egress is limited to only one side of the at least one cell.

3 AF IFW

| TRANSMITTAL OF APPEAL BRIEF (Large Entity) | Docket No. H0004181-5601 |
|---|---|

In Re Application Of: **ROBERT D. HORNING**



| Application No. | Filing Date | Examiner | Customer No. | Group Art Unit | Confirmation No. |
|---|---|---|---|---|---|
| 10/673,453 | September 30, 2003 | TAMAI, Karl I. | 00128 | 2834 | 2002 |

Invention: **POLYMER ACTUATOR HAVING A CIRCULAR UNIT CELL**

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **February 21, 2006**

The fee for filing this Appeal Brief is: **$500.00**

- ☐ A check in the amount of the fee is enclosed.
- ☐ The Director has already been authorized to charge fees in this application to a Deposit Account.
- ☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **03-3975**
- ☐ Payment by credit card. Form PTO-2038 is attached.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

Lawrence D. Eisen

*Signature*

Dated: **April 20, 2006**

**Lawrence D. Eisen**
**Registration No. 41,009**
**Pillsbury Winthrop Shaw Pittman LLP**
**1650 Tysons Boulevard**
**McLean, VA 22102**

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

_____.
*(Date)*

*Signature of Person Mailing Correspondence*

*Typed or Printed Name of Person Mailing Correspondence*

cc: